

Welcome to Hydrology

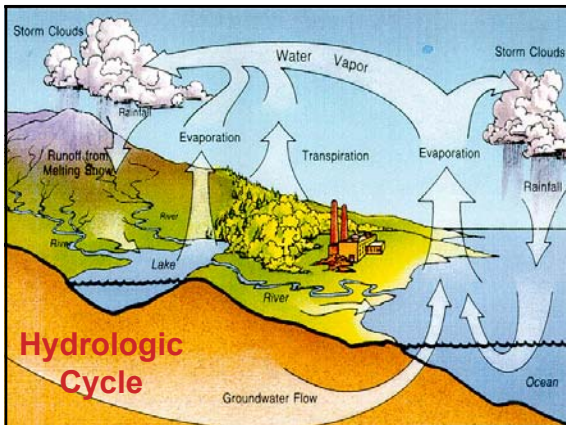
Nicole Clegg – NHDES/NH Project WET

Alicia Carlson – NHDES

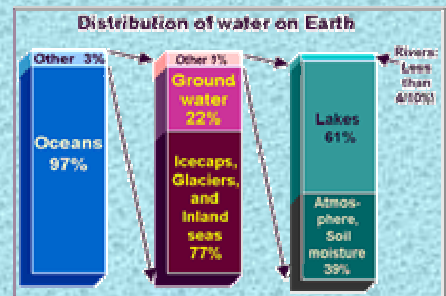
GLOBE contact – Jen Bourgeault

Hydrology is...

- The science of water in all its forms on, in, and over the land areas of the earth, including its:
 - distribution
 - circulation
 - behavior
 - chemical and physical properties
 - reaction of the environment with water.



Global Water Distribution Water covers 71% of Earth



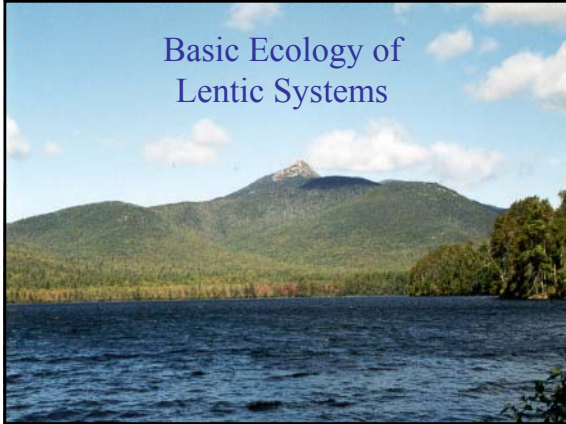
All the Water in the World

Reservoir	% Total Volume
Atmosphere/Soil moisture/Biosphere	0.006
Rivers and lakes	0.01
Groundwater	0.68
Glacial and other land ice	2.051
Oceans and sea ice	97.25
TOTAL:	100.000

Focus on Fresh Surface Water

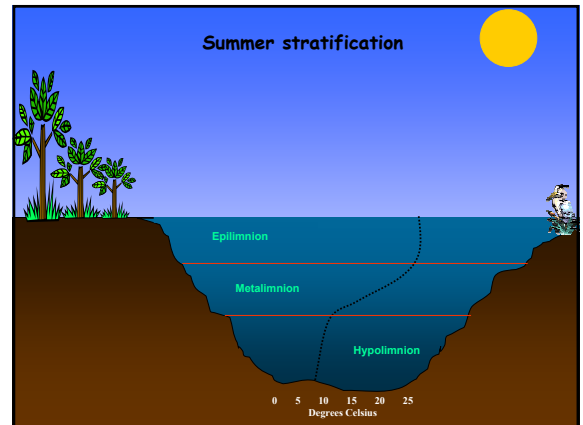
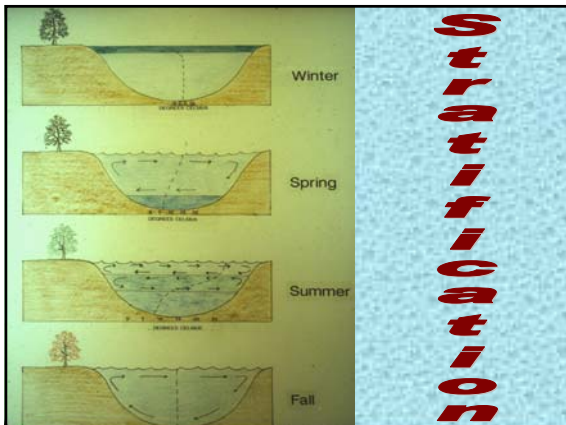
- Lentic systems
 - Nonflowing water (retained for days, weeks, or years).
 - Lakes, ponds, wetlands.
 - Energy fixed primarily in lake.
 - Most organisms suspended in water column.
- Lotic systems
 - Flowing water (in transit).
 - Rivers and streams.
 - Energy fixed primarily in land surrounding the system.
 - Most organisms near, on or in substrate.

Basic Ecology of Lentic Systems



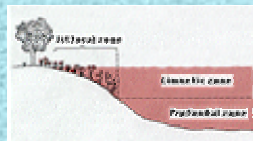
Lentic Systems 101 Key = Vertical Layers

- Because the water is not flowing, many lentic systems vertically stratify into layers.
- Stratification occurs because of differences in water temperature and density.
- In NH, during seasons of “extreme” temperature (summer and winter), lakes stratify and during seasons of moderate temperature (spring and fall) lakes mix or “turnover.”



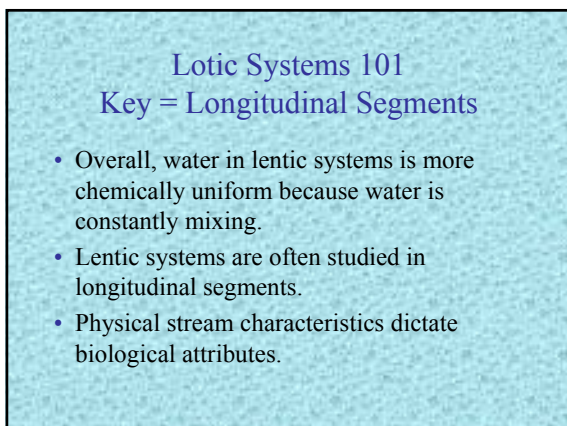
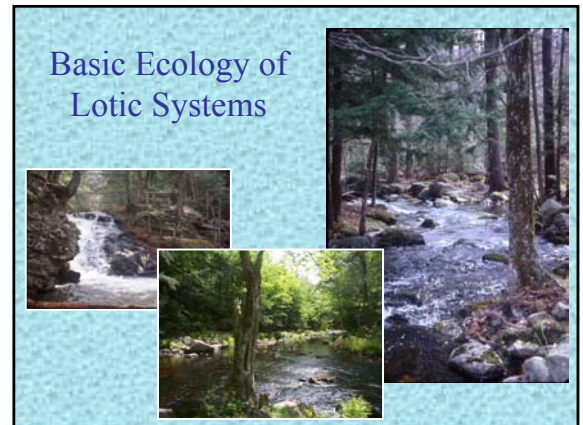
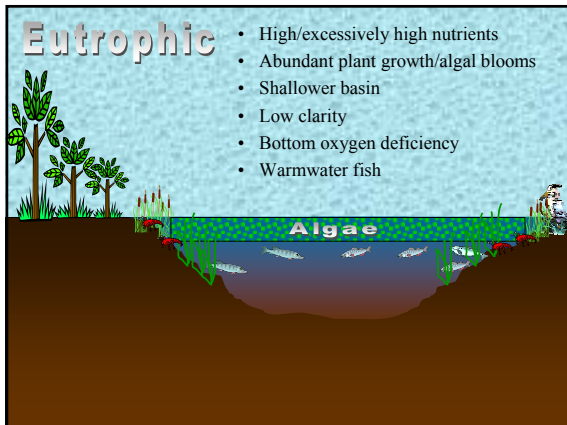
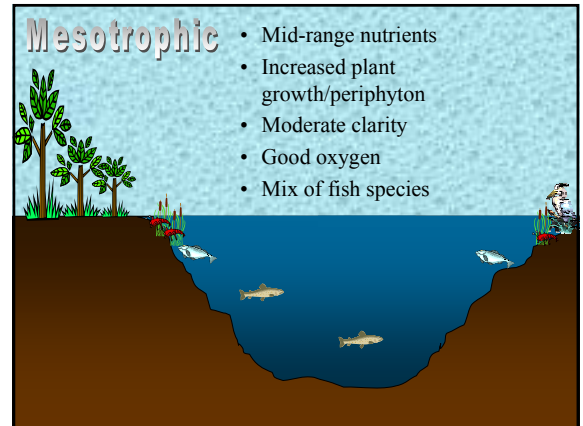
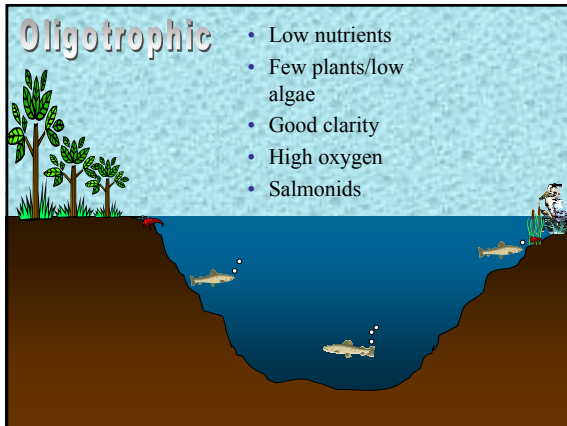
Lake Zones

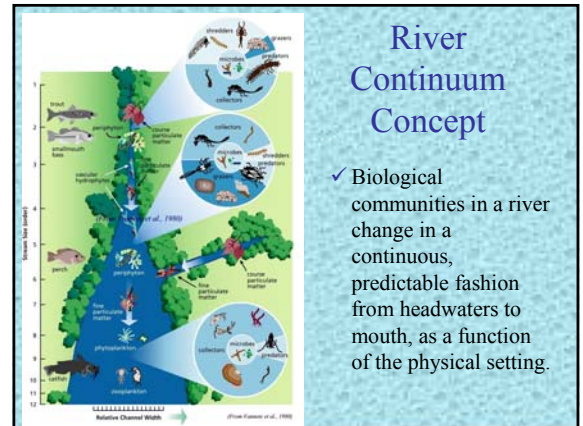
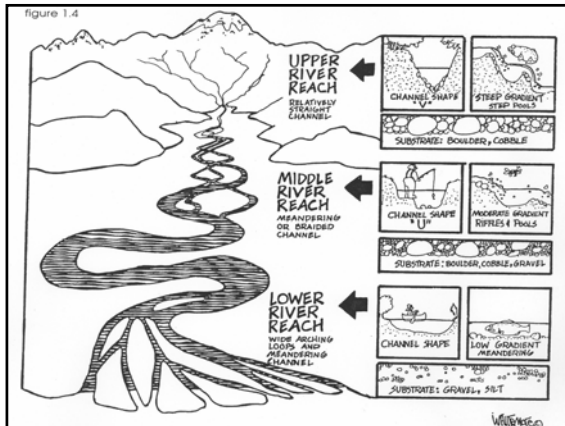
- In addition to layers, lakes also have three distinct zones.
 - Littoral zone: near shore, penetration of sunlight, macrophytes
 - Limnetic zone: open water, penetration of sunlight, periphyton
 - Profundal zone: open water, no sunlight penetration



Lake Classification

- Limnologists classify lakes according to their trophic states (extent of nutrient input.)
 - Rate of nutrient input (natural and human).
 - Morphology (shape of lake basin).
 - Biological community.





Headwaters

- Narrow channel
- Shaded – low light, consistent temp
- Few to no plants
- Energy from outside (CPOM)
- Life cycles keyed to leaf fall
- Benthic organisms = shredders, collectors



Midreach

- >10' wide channel
- Canopy open – warmer, variable temp
- Meanders, riffles and pools
- Increased plants and nutrients in water (FPOM)
- Benthic organisms = fewer shredders, more collectors, scrapers and grazers



Mouth

- Wide, deep channel
- Open to sunlight
- Big arcing meanders
- High sediment inputs (high turbidity and nutrient levels, low light penetration)
- Lower primary productivity (FPOM)
- Benthic organisms = collectors



Common characteristics of lentic and lotic

- Quality of water in both systems can be affected by natural and human factors.
- The health of both systems depends on the inputs from the land area draining to it.

Water Quality

- Where does pollution come from?
- How can you measure it?



Measuring Water Quality

- The bulk of today will be spent measuring water quality in two ways:
 - Through chemical means
 - Through biological means
 - Using GLOBE protocols

Chemical vs. Biological Assessment

	Chemical	Biological
Pros	<ul style="list-style-type: none"> • Highly sensitive • Measures specific parameters • Detect immediate changes 	<ul style="list-style-type: none"> • Directly measures impact to the biota • Takes cumulative and temporal impacts into consideration
Cons	<ul style="list-style-type: none"> • Cannot determine long term impacts • Only useful if impact occurs at time of sampling 	<ul style="list-style-type: none"> • Reduces ability to detect immediate impacts • Unable to confirm impact source

Aquatic systems reflect their surroundings

- Both lentic and lotic systems include not only the direct body of water but also the land area that drains to it – WATERSHED!

